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Participatory Variety Selection of Fababean (*Vicia faba* L.) for Yield and Yield Components in Gunabegemidir District, North Western Ethiopia

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Abstract: Present studies were executed in Gunabegemidir districts in North Western Ethiopia to assess the performance of Fababean varieties and evaluate farmers' selection criteria for Fababean variety choice, and classify the principal farmers' criteria in the study area. Seven Fababean varieties were evaluated in randomized complete block design with three replications in the 2020/2021 and 2021/2022 main rainy seasons. Farmers' evaluation of Fababean was made at different stages of the crop, at flowering, at maturity, and at harvest. Farmers' confirmed Plant establishment, Overall performance, Stem strength, Number of branches, Seed size, and plant height were identified as the most important farmer's selection criteria. Statistical analysis showed that Fababeans varieties were significantly ($P<0.05$) different by grain yield at Ata Kebele in the 2021 cropping seasons. The highest grain yield was obtained from Hachalu (3516 kg ha^{-1}) variety at Ata Kebele. Hence, including farmers' preferences in a variety selection process is a paramount important. Therefore, based on considerately measured parameters, farmers' preferences the Fababean varieties Gora (4901 kg ha^{-1}), Numan (4279 kg ha^{-1}), and Ashebeka (4364 kg ha^{-1}) were selected for the study area. Among the seven tested Fababean varieties, those varieties were found sound adapted at Gunabegemidir district in the farmer's selection criteria. Therefore, farmers are recommended to use those varieties for production and expand in the next season for similar agroecology of the South Gonder zone.

Keywords: Fababean, Participatory Variety Selection, Gunabegemidir, Grain Yield

1. Introduction

Ethiopia is the second largest Fababean producer country in the world next to China (FAO, 2019). The total cultivated area of Fababean reached 504,569.99 hectares with a total production of 10,706,365.38quintals with an average national yield was 21.22quintals per hectare [4]. Fababean is the dominant pulse crop in Ethiopia in terms of area coverage and amount of production [3]. It is mainly cultivated in mid and high-land areas with an elevation ranging from 1800-3000 meters above sea level. It is grown in different agro-ecologies receiving average annual rainfall ranging from 700-1100 mm with a daily temperature of 10-22^{o}C. Fababean plays a great role in the people's lives of the farming communities of Ethiopia as a source of food and feed [1].

Fababean is the most important cool-season food legume grown in the highlands of Ethiopia [12]. The crop has multiuse and is consumed as dry seeds, green seeds, or processed food. Its products are rich in protein in the human diet, while dry seeds, green haulm, and dry straw are used as animal feeds [7].

Over the years, many Fababean varieties have been evaluated and released by national and regional agricultural research centers. However, farmers do not grow improved high-yielding varieties, disease and pest resistant as these

varieties were released without the participation of farmers in considered areas. And also, they have no sufficient information about agronomic practices and the economic importance of the released Fababean varieties [2]. Therefore, the experiment was conducted to evaluate Fababean varieties for yield and yield components and to participate farmers for varietal selection by setting their criteria at Gunabegemidir district at Ata and Awuzet Kebeles.

2. Material and Methods

2.1. Site Description

The experiment was conducted at Gunabegemidir district in farmers' fields during the 2021 and 2022 main cropping seasons. Gunabegemidir has an altitude of 2770 m. a. s. l, in South Gondar Zone. The average annual rainfall and temperature of Gunabegemidir are about 1750 mm and 17.0°C respectively. The major soil types are clay loam.

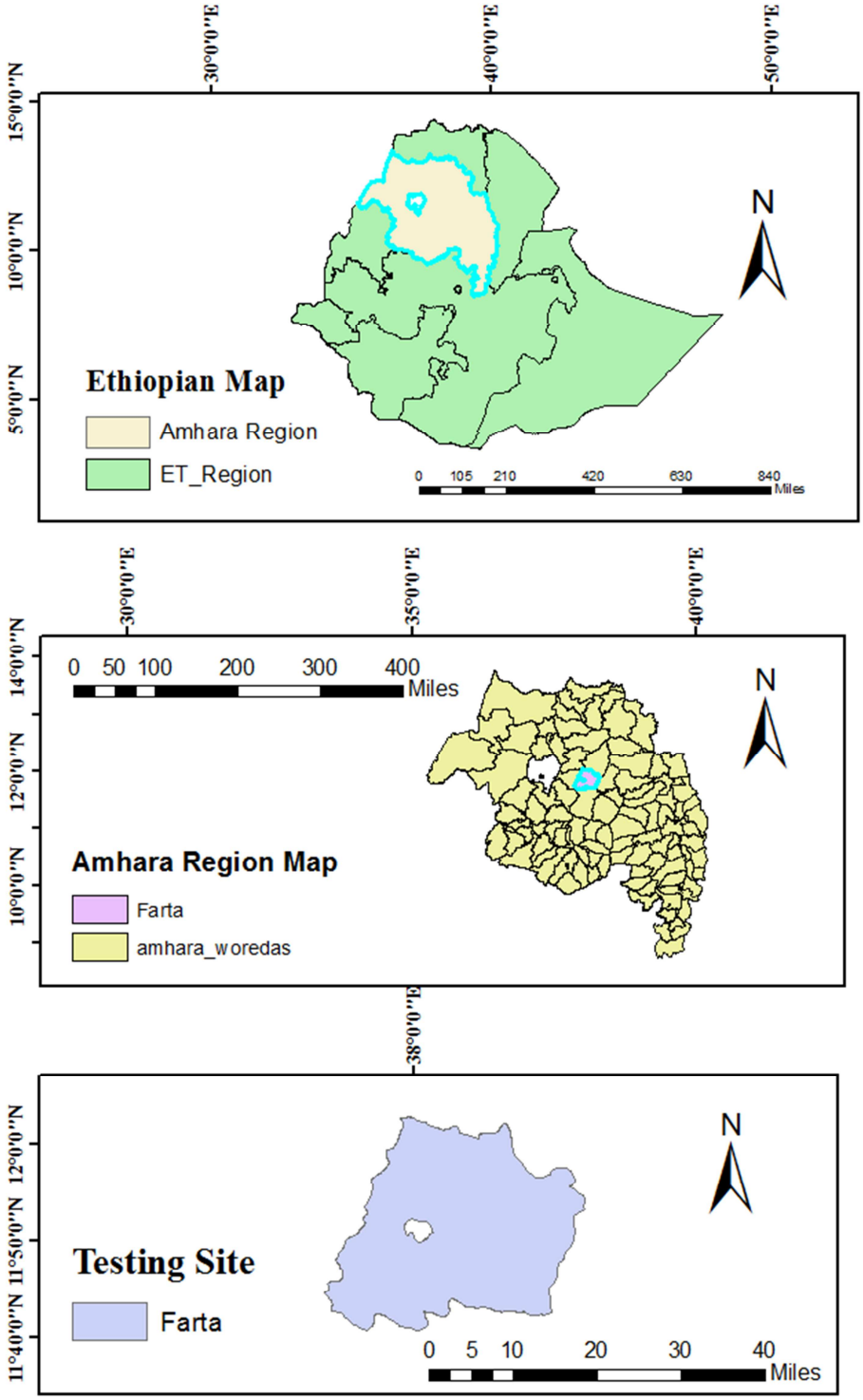

Figure 1. *Experimental Site.*

2.2. Experimental Material

Seven Fababean varieties Tumsa, Hachalu, Dosha, Ashebeka, Gora, Numan, and local check released from Holeta agricultural research center and local cultivars were used as experimental material. The varieties were laid out in a randomized complete block design with three replications. Each variety was planted in 10 rows with a 4m x 4m plot size, 0.4m spacing between rows, 1.5 m between replications, and 1m between plots. The gross plot area is $16m^2$. The land was prepared and plowed by oxen two times. DAP fertilizer was applied at a rate of 100kg ha^{-1} during sowing.

2.3. Data Collected

2.3.1. Plant Basis

The number of pods per plant was recorded by counting the number of pods present on the main stem and branches in each five randomly selected plans. The number of seeds per pod was valued as the number of seeds per pod; the average number of seeds per plant was divided by the average number of pods per plant. Plant Height was taken as the average height of five randomly selected plants in each net plot measured in cm from the ground surface to the top of the main stem at physiological maturity.

2.3.2. Plot Basis

Days to 50% flowering: number of days taken by each variety from the day of sowing to the day on which 50 percent of the plants on a plot opened a flower. Days to maturity: Number of days from sowing to the stage when 90% of the plants in a plot have changed the color of their pods from green to lemon yellow. The grain yield was weighed using an electronic balance per plot and converted into kg/ha for each variety in three replications then adjusted to 10% of moisture content. Thousand-seed weight: the well-dried and cleaned seeds from each variety were taken randomly and counted, weighed, and recorded in grams. The farmer's evaluation and selection were collected from single plot observation on the farmer's field. Farmers' perceptions of plant establishment, overall performance, stem strength, number of branches, and seed size were taken as the rate of 5= very good, 4= good, 3= average, 2= poor, and 1 = very poor.

2.4. Data Analysis

The collected data were analyzed using R statistical software. Mean separation was carried out using the Least Significant Difference (LSD) test at a 5 % probability level [8]. Farmer's selection data were analyzed using a simple ranking method by the given value [5].

The linear mixed model was used in the analysis of variance combined over locations.

$$Y_{ijk}=\mu+g_i+e_j+bk_{(jj}+ (ge)_{ij}+\varepsilon_{ijk}$$

Where: Y_{ijk}=the response of Y trait from the i^{th} Varieties, grown in the k^{th} block of j^{th} location.

μ=Grand mean
g_i=The effect of the i^{th} varieties
e_j=The effect of j^{th} location
bk (k) j=The effect of k^{th} rep in j^{th} location.

3. Result and Discussion

The combined analyses of Fababean varieties from Ata and Awuzet kebeles in the Gunabegemidir district showed highly significant varietal differences at ($p \leq 0.01$) in days to flowering, days to maturity and hundred seed weight and significant varietal differences at ($p \leq 0.05$) in the number of pods per plant and the number of seeds per pod. The location effect exposed that highly significant variation ($p \leq 0.01$) for days to flowering, days to maturity, plant height, number of pods per plant, hundred seed weight, and grain yield. But, Location by variety interaction showed a non-significant difference for days to maturity, plant height, number of seeds per pod, number of pods per plant, hundred seed weight, and grain yield, except stand count at harvest and days to flowering. Year by location by variety interaction showed a non-significant difference for days to flowering, days to maturity, plant height, number of pods per plant, hundred seed weight, grain yield, and plant height, except for the number of seeds per pod and stand count at harvest. This indicates that the Fababean varieties responded similarly to Ata and Awuzet kebeles. So the combined analysis showed a clear picture of the tested location (Table 1).

3.1. Number of Pods Per Plant

Statistical analysis showed that Fababean varieties significantly ($P<0.05$) affected the number of pods per plant at Ata Kebele in both two consecutive cropping seasons. Whereas a Non-significant difference was observed among Fababean varieties for the number of pods per plant at Awuzet Kebele in the 2021, and 2022 cropping seasons (Tables 3 and 5). The maximum number of pods per plant was recorded from Hachalu (11.8) and Dosha (11.4) varieties at Ata Kebele. Whereas the smallest number of pods per plant was recorded at Gora (8.4) variety at Ata Kebele in the 2021 and 2022 cropping seasons (Tables 2 and 4).

3.2. Number of Seeds Per Pod

Statistical analysis showed that fababean varieties significantly ($P<0.05$) affected the number of seeds per pod at Ata kebele in both two consecutive cropping seasons (Tables 2 and 4). Whereas a non-significant difference was observed among Fababean varieties for the number of seeds per pod at Awuzet kebele in 2021, and 2022 cropping seasons (Tables 3 and 5). The maximum number of seeds per pod was recorded from the local check (3.27) variety. Whereas the smallest number of seeds per pod was recorded at Numan (2.8) and Tumsa (2.73) varieties at Ata kebele in the 2021 cropping season (Tables 2). The maximum number

of seeds per pod was reported from Hachalu (4.00) variety at Ata Kebele in the 2022 cropping season (Table 4).

3.3. Plant Height

Statistical analysis showed that Fababean varieties were significantly (P<0.05) affected by plant height at Ata and Awuzet kebele in the 2022 cropping seasons (Tables 4 and 5). Whereas, Non-significant difference was observed among Fababean varieties for plant height at Awuzet and Ata kebele in the 2021 cropping season (Tables 2 and 3). The maximum plant height was recorded from Tumsa (140) variety. Whereas, the shortest plant heights were recorded at Numan and Local check varieties with 128.86 and 125.73cm height, respectively at Ata kebele in 2022 cropping seasons (Table 4). The highest plant height was recorded from Tumsa (107.2) variety. Whereas, the shortest plant heights were recorded at Hachalu and variety with 87.53cm, respectively at Awuzet kebele in 2022 cropping seasons (Table 5).

3.4. Days to Flowering

A significant difference (P<0.05) was observed among Fababean varieties for days to flowering at Ata Kebele and Awuzet Kebele in the 2021 cropping season (Table 1). The longest days to flowering were recorded from Hachalu (107.3), Dosha (107.3), and Numan (107.7) varieties. Whereas the shortest days to flowering were recorded from Local check (104.3) and Ashebeka (104.3) varieties at Ata Kebele in the 2021 cropping season (Table 2). On the other hand, the maximum number of days to flowering at Awuzet Kebele was observed from Dosha (107.0) and Numan (104.3) varieties, while the lowest was recorded from Tumsa (104.3) varieties in the 2021 cropping season (Table 3). In agreement with this result [16] reported the longest days of flowering were obtained for the variety Hachalu. The maximum number of days to flowering was recorded from Gora (100.67) and Numan (100.33) varieties. While the minimum days to flowering were recorded from the Local check (95.33) variety at Ata Kebele in the 2022 cropping season (Table 4). A non-significant difference was observed among Fababean varieties for days to flowering at Awuzet Kebele in the 2022 cropping season (Table 5). Generally, this result indicates that varieties like Numan, Hachalu, and Dosha are late flowering varieties, while local check and Tumsa are early flowering varieties at both locations in two consecutive years (Tables 2, 3, and 4). According to the researchers [10, 14, 13] reported similar results.

3.5. Days to Maturity

A significant difference (P<0.05) was observed among Fababean varieties for days to maturity at Ata Kebele in the 2021 cropping season (Table 2). The non-significant difference was observed among Fababean varieties for days to maturity at Awuzet Kebele in 2021, at Ata Kebele in 2022, and At Awuzet Kebeles 2022 cropping season (Tables 2, 4, and 5). The longest days to maturity were recorded from Hachalu (159) varieties at Ata Kebele in the 2021 cropping season (Table 2). Similar results lined by [16, 6] reported the longest days to maturity from the variety of Hachalu.

3.6. Hundred Seed Weight

A hundred seed weights of Fababean varieties were significantly (p<0.05) affected in both locations and two consecutive years. The maximum hundred seed weight was recorded on Gora (111.1), and Numan (116.5) varieties at Ata kebele. While the lowest hundred seed weight was recorded on Dosha (87.17) variety at Ata Kebele in the 2021 cropping season (Table 2). According to the research [16] Gora variety was provided with a higher hundred seed weight. On the other hand, the maximum hundred seed weight at Awuzet was recorded from Numan (116.2) and Tumsa (94.73) varieties. While the minimum hundred seed weight was from local check, and Dosha varieties with an average hundred seed weight of 88.33 and Dosha respectively in the 2021 cropping season (Table 3). The maximum hundred seed weight was recorded on Numan (115.93), and Tumsa (94.27) varieties at Ata kebele. While the lowest average hundred seed weight was recorded on Dosha (86.9) and local check (88.33) varieties at Ata kebele in the 2022 cropping season (Table 4). On the other hand, the maximum hundred seed weight at Awuzet was recorded from Numan (108.57) varieties, while the minimum hundred seed weight was from local check, Dosha, and Hachalu varieties with an average hundred seed weight of 78.8gm, 83.9gm, and 82.42gm respectively in 2022 cropping season (Table 5). Tewodros T et al. [13] reported that hundred seed weights ranged from the smallest to local check and showed highly significant differences among the tested varieties. Similar results lined the study of Ashenafi M and Mekuria W. [3] who reported that the varieties evaluated in the study showed significant variation in the test weight of the seeds. A similar result was in line with [11] reported that the Tumsa variety was a higher hundred seed weight.

3.7. Grain Yield

Statistical analysis showed that Fababean varieties were significantly (P<0.05) different by grain yield at Ata kebele in 2021 cropping seasons (Table 3). Whereas, Non-significant difference was observed among Fababean varieties for grain yield at Awuzet 2021, at Ata 2022, and at Awuzet 2022 cropping season (Tables 3, 4, and 5). The maximum grain yield was harvested from the Hachalu variety which is (3516 kg ha^{-1}) at Ata kebele (Table 2). While the lowest grain yield was recorded at the Gora variety with an average grain yield of 2060 kg ha^{-1} (Table 2). The result was in line with Tewodros *et al.,* (2015) who reported that the highest yield was obtained on Hachalu varieties. Contradict to this result, Mitiku A, *et al*., 2015 and [16] Gora variety was provided the higher grain yield.

Table 1. *The mean squares for different sources of variation for fababean varieties studied at Guna Begemidir District, 2021 and 2022.*

SOV	SH	DF	DM	PH	NPPP	NSPP	GY	HSW
Rep	1705.15 ^{ns}	7.048 ^{ns}	2.30 ^{ns}	419.17 *	5.59 ^{ns}	0.480 **	791293.2ns	39.56 ^{ns}
Loc	9578.68 **	629.762**	3963.44 **	1200.07 **	63.44 **	0.008 ^{ns}	44403022.9**	304.57**
Yr	23366.68 **	128.762 **	293.44 ^{ns}	794.27 **	18.11 ^{ns}	0.008 ^{ns}	30292666.9**	335.80 **
Var	1833.27 *	21.111 **	25.75 **	127.88 ^{ns}	19.91 *	0.211 *	701060.8^{ns}	1418.38**
loc*yr	10.01 ^{ns}	640.762 **	11.44 ^{ns}	14339.36 **	462.01 **	1.493**	165488622.7**	253.59 **
loc*var	1583.46 *	7.095 *	1.16 ^{ns}	83.74 ^{ns}	8.14 ^{ns}	0.089 ^{ns}	829327.7ns	15.55 ^{ns}
yr*var	1306.12 ^{ns}	0.873 ^{ns}	1.16 ^{ns}	114.08 ^{ns}	3.53 ^{ns}	0.178 *	789725ns	14.78 ^{ns}
loc*yr*var	2481.96 **	1.095 ^{ns}	1.16 ^{ns}	28.65 ^{ns}	4.48 ^{ns}	0.341 **	660729.2ns	16.62 ^{ns}
Error	661	2.35	6.07	94.62	378.67	0.07	702654	29.14
Mean	256.7	104.83	164.91	118.25	12.98	3.05	2759	97.7
CV	10	1.46	1.49	8.22	20.38	8.84	30.37	5.39
R^2	0.69	0.92	0.93	0.79	0.67	0.65	0.87	0.86

SOV=Source of variation, rep=replication, loc=location, Yr=year, var=variety,*=significant difference at p<0.05, **=highly significant difference at p<0.01, ns=non-significant difference, SCH= stand count at harvest, DF=days to flower, DM=days to mature, NSPP=seeds per pod, PH=plant height, NPPP=number of pods per plant, GY= grain yield, HSW= hundred seed weight

Table 2. *Means the separation of yield and yield components of fababean PVS at Ata kebele, Gunabegemidir district, 2021 cropping season.*

Variety	SH	DF	DM	PH	NPPP	NSPP	GY	HSW
Ashebeka	256.3^{bc}	104.3^{c}	156.7^{ab}	117.1^{a}	10.4^{abc}	2.93^{ab}	2646^{ab}	105^{bc}
Dosha	237.3^{c}	107.3^{a}	152.00 ^{ab}	108.3^{a}	11.4^{ab}	3.07^{ab}	2937^{ab}	87.17^{d}
Gora	249^{bc}	106.7^{ab}	157^{ab}	110.3^{a}	8.4^{c}	3.00^{ab}	2060^{b}	111.1^{a}
Hachalu	302^{a}	107.3^{a}	159^{a}	119.7^{a}	11.8^{a}	2.80^{b}	3516^{a}	95.27^{cd}
Local check	255.3^{bc}	104.3^{c}	155.7^{ab}	108.7^{a}	10.7^{abc}	3.27^{a}	2542^{ab}	88.67^{d}
Numan	286.3^{ab}	107.7^{a}	155.7^{ab}	110.7^{a}	9.0^{bc}	2.80^{b}	2643^{ab}	116.5^{a}
Tumsa	255^{bc}	105^{bc}	154.7^{ab}	109.4^{a}	10.6^{abc}	2.73^{b}	2440^{ab}	95.33^{cd}
GM	263	106.1	155.8	112	10.24	2.94	2683	99.87
CV	8.17	0.94	1.92	6.00	14.40	8.00	20.72	5.74
R^2	0.65	0.77	0.51	0.59	0.52	0.57	0.65	0.85

GM=grand mean, CV= coefficient of variation, SCH= stand count at harvest, DF=days to flower, DM=days to mature, NSPP=seeds per pod, PH=plant height, NPPP=number of pods per plant, GY= grain yield, HSW= hundred seed weight

Table 3. *The means separation of yield and yield components of fababean PVS at Awuzet kebele, Guna Begemidir district, 2021 cropping season.*

Variety	SH	DF	DM	PH	NPPP	NSPP	GY	HSW
Ashebeka	266.33^{bc}	105.7^{ab}	171.33^{a}	137.60 ^{a}	15.33 ^{a}	3.00^{a}	3828.1^{a}	104.50^{bc}
Dosha	306.00^{ab}	107.0^{a}	168.67^{a}	127.40 ^{a}	17.67 ^{a}	3.00^{a}	4114.6^{a}	87.00^{d}
Gora	237.67^{c}	105.3^{ab}	170.33^{a}	121.33 ^{a}	14.67 ^{a}	3.00^{a}	3906.3^{a}	110.80^{ab}
Hachalu	300.33^{ab}	106.7^{ab}	172.33^{a}	129.13 ^{a}	18.00 ^{a}	3.33^{a}	4010.4^{a}	95.07^{cd}
Local	327.67^{a}	106.0^{ab}	169.00^{a}	133.45 ^{a}	17.33 ^{a}	3.00^{a}	4114.6^{a}	88.33^{d}
Numan	261.67^{bc}	104.3^{a}	170.66^{a}	127.45 ^{a}	15.00 ^{a}	3.33^{a}	4036.0^{a}	116.20^{a}
Tumsa	286.33^{abc}	104.3^{b}	169.67^{a}	138.13 ^{a}	14.67 ^{a}	3.00^{a}	4244.0^{a}	94.73^{a}
GM	283.71	106	170.29	130.6	16.67	3.19	4036.46	99.53
CV	11.64	1.33	1.36	8.32	14.97	10.45	7.8	5.78
R^2	0.57	0.53	0.32	0.61	0.43	0.59	0.25	0.85

GM=grand mean, CV= coefficient of variation, SCH= stand count at harvest, DF=days to flower, DM=days to mature, NSPP=seeds per pod, PH=plant height, NPPP=number of pods per plant, GY= grain yield, HSW= hundred seed weight

Table 4. *The means separation of yield and yield components of fababean PVS at Ata kebele, Gunabegemidir district, 2022 cropping season.*

Variety	SH	DF	DM	PH	NPPP	NSPP	GY	HSW
Ashebeka	246.67^{a}	95.67^{bc}	161.33^{a}	134.73^{ab}	14.67^{ab}	3.00^{b}	4364^{a}	104.53^{bc}
Dosha	238.33^{a}	99.33^{abc}	158.66^{a}	132.06^{ab}	13.33^{ab}	3.00^{b}	5820^{a}	86.90^{d}
Gora	199.33^{b}	100.67^{a}	160.33^{a}	135.00^{ab}	10.00^{b}	3.33^{b}	4901^{a}	110.83^{ab}
Hachalu	222.67^{ab}	99.67^{ab}	162.33^{a}	129.80^{ab}	19.00^{a}	4.00^{a}	3928^{a}	94.60^{cd}
Local	238.67^{a}	95.33^{c}	159.00^{a}	125.73^{b}	13.00^{ab}	3.00^{b}	3547^{a}	88.33^{d}
Numan	225.67^{ab}	100.33^{a}	160.66^{a}	126.86^{b}	14.67^{ab}	3.00^{b}	4279^{a}	115.93^{a}
Tumsa	231.67^{ab}	95.67^{bc}	159.66^{a}	140.00^{a}	13.33^{ab}	3.00^{b}	3188^{a}	94.27^{a}
GM	229	98.09	160.28	132	14	3.19	4289	99.34
CV	8.17	2.28	1.45	5.19	29.5	6.84	36.39	5.83
R^2	0.7	0.64	0.32	0.52	0.41	0.82	0.35	0.85

GM=grand mean, CV= coefficient of variation, SCH= stand count at harvest, DF=days to flower, DM=days to mature, NSPP=seeds per pod, PH=plant height, NPPP=number of pods per plant, GY= grain yield, HSW= hundred seed weight

Table 5. *The means separation of yield and yield components of Fababean PVS at Awuzet kebele, Gunabegemidir district, and 2022 cropping season.*

Variety	SH	DF	DM	PH	NPPP	NSPP	GY	HSW
Ashebeka	213.33^{d}	174.33^{a}	174.33^{a}	99.73^{ab}	10.33^{a}	2.67^{a}	2110a	95.20^{b}
Dosha	233.00^{cbd}	171.67^{a}	171.67^{a}	96.40^{ab}	11.33^{a}	3.00^{a}	2033a	83.90^{c}
Gora	266.67^{abc}	173.33^{a}	173.33^{a}	100.2^{ab}	10.00^{a}	2.67^{a}	2775a	99.53^{b}
Hachalu	226.00^{cd}	175.33^{a}	175.33^{a}	87.53^{b}	11.00^{a}	3.00^{a}	2878a	82.42^{c}
Local check	282.33^{a}	172.00^{a}	172.00^{a}	97.00^{ab}	12.00^{a}	3.00^{a}	3186a	79.80^{c}
Numan	275.00^{a}	173.67^{a}	173.67^{a}	100.3^{ab}	10.67^{a}	3.00^{a}	3139a	108.57^{a}
Tumsa	261.00^{abc}	172.67^{a}	172.67^{a}	107.2^{a}	12.00^{a}	3.00^{a}	3625a	95.00^{b}
GM	251	109	173	98.34	11.05	2.9	28.21	92.06
CV	10.49	1.28	1.34	10.43	20.03	9.69	11.01	5.43
R^2	0.62	0.49	0.32	0.34	0.17	0.47	39.03	0.87

GM=grand mean, CV= coefficient of variation, SCH= stand count at harvest, DF=days to flower, DM=days to mature, NSPP=seeds per pod, PH=plant height, NPPP=number of pods per plant, GY= grain yield, HSW= hundred seed weight

Table 6. *Simple correlation coefficients (r) for agronomic traits of the tested fababean PVS at Ata kebele, Gunabegemidir Districts in 2021.*

	SCH	DF	DM	PH	PPP	SPP	GY	HSW
SCH	1							
DF	0.04	1						
DM	0.01	-0.27	1					
PH	0.29*	-0.34	0.18	1				
NPPP	0.23	0.12	-26	0.26	1			
NSPP	-0.3	-0.24	0.33	0.13	-0.08	1		
GY	0.5*	0.28	-0.34	0.05	0.04*	-0.109	1	
HSW	-0.63	0.05	0.2	-0.102	-0.49	0.22	-0.3	1

SCH= stand count at harvest, DF=days to flower, DM=days to mature, SPP=seeds per pod, PH=plant height, PPP=number of pods per plant, GY= grain yield, HSW=hundred seed weight

3.8 Association Among the Studied Characters

Grain yield is the most complex trait and it is influenced by genetic and environmental factors that determine the productivity of the Fababean varieties. Therefore, understanding of inter-relationships of grain yield and other traits is highly important for formulating selection criteria. The correlation coefficient among phonological and agronomic traits of the tested Fababean varieties is indicated in (Table 6). Days to 50% flowering had a non-significant and negative correlation with days to maturity (r= -0.27) but Days to 50% flowering with grain yield had a non-significant and positive correlation (r=0.28). Days to 50% flowering had a negative and non-significant association with plant height (r=-0.34^{ns}). However, Days to 50% flowering had a positive and non-significant association with plant height (r=0.12^{ns}). Grain yield had a positive and highly significant correlation with the number of pods per plant (r=0.04*). These results gave a clear indication that the yield components were mutually closely associated. This is in agreement with those finding [9, 15] which is grain yield had a positive correlation with plant height, days to 50% flowering, and number of seeds per pod.

Table 7. *Farmers' selection of Fababean varieties at Awuzet Kebele, Gunabegemidir district, 2021 cropping season.*

Variety	Farmer's preference criteria									
	PES	MAP	STS	NB	SS	PH	Earliness	Total	mean	Rank
Dosha	4	2	3	2	2	2	3	18	2.57	5
Numan	5	4	5	5	4	5	5	33	4.71	1
Tumsa	4	3	4	3	3	3	3	23	3.29	4
Ashebeta	5	4	3	3	3	3	4	25	3.57	3
Gora	5	4	4	4	3	4	4	28	4.00	2
Hachalu	3	1	1	2	1	1	1	10	1.43	7
Local check	4	2	2	1	1	2	2	14	2	6

PES=plant establishment, OAP=overall performance, STS=stem strength, NB=Number of Branches, SS=seed size, PH=plant height; Rating of the performance of variety for given criteria: 5= very good, 4= good, 3= medium, 2= poor, and 1 = very poor.

3.9. Farmers' Variety Evaluation and Selection

The farmers who participated in and evaluated the trial were representative of the area and had long experience in farming. Selected farmers from the districts were asked to set their priority selection criteria and farmers set their criteria during the flowering, maturity, and harvest stage of Fababean varieties. The criteria farmers used in identifying suitable varieties depend on the existing constraints and opportunities farmers faced in their locality. Accordingly, Plant Establishment, Overall Performance, Stem Strength, Number of Branches, Seed Size, and plant height were identified as

the most important farmer's selection criteria. Individual farmers scored each variety for individual traits considered important by them and the ranking of varieties was done on a scale of 1-6, 1 being the highest score representing and 6 being very poor. Researchers and DA personnel assisted farmers during scoring. The farmers also provided an overall score for each variety based on all important traits.

In the overall scoring and ranking of the Fababean PVS variety, Numan was considered the best variety followed by Gora, Ashebeka, and Tumsa (Table 6). The local and Hachalu were the least-ranked varieties because of poor plant establishment, poor performance, and the low number of branches. Variety Numan ranked first because of its best performance, good stem strength, the higher number of branches, and excellent plant establishment. Most Fababean improved varieties ranked significantly higher than the local variety.

The farmers always ranked the improved varieties significantly superior to local varieties for grain yield, yield components, and disease resistance. This result indicated that Numan, Gora, and Ashebeka were farmers' and researcher's best preferred and top-performed varieties which can be considered as a promising variety to be widely produced by Fababean farmers.

4. Conclusion and Recommendation

Participatory variety selection was significantly important to evaluate and select new varieties and is an advantage to exploit farmers' indigenous knowledge of identifying adapted varieties that best meet their interests. Therefore, based on considerately measured parameters, farmers' preferences the Fababean varieties Gora, Numan, and Ashebeka were selected for the study area. Among the seven tested Fababean varieties, those varieties were found sound adapted at Gunabegemidir district in the farmer's selection criteria. Therefore, farmers are recommended to use those varieties for production and expand in the next season for similar agroecology of the South Gonder zone.

Figure 2. *Farmers during variety selection.*

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